Linac Laser Notcher Status

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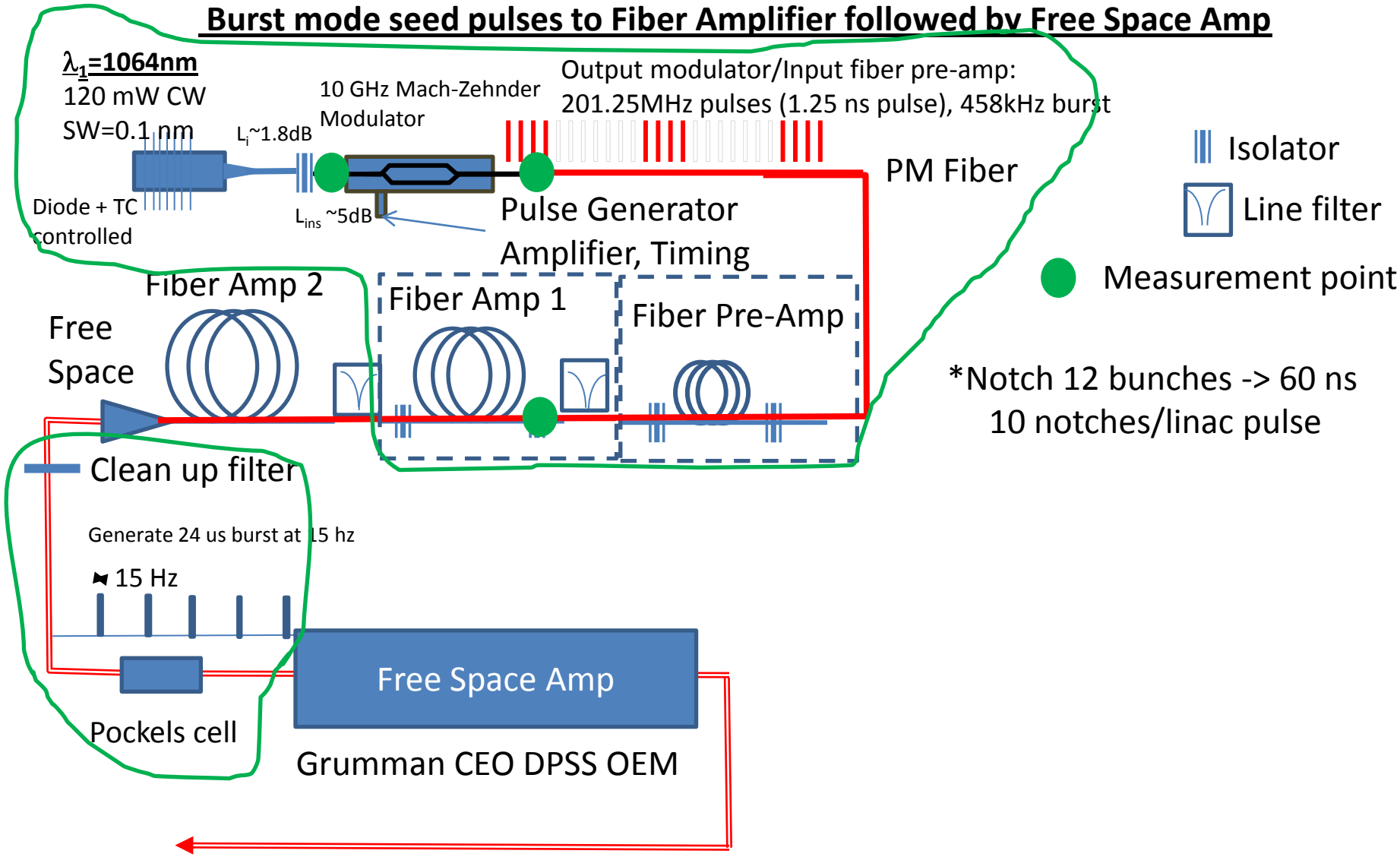
Laser Notcher System

- Major Components of the system
  - Optical pulse generation
  - Fiber amplifier system (2 + 1 stages)
  - Macro pulse generation (at 15 Hz) (Pockels cell)
  - Free space laser amplifier
  - Laser transport and beam shaping / optical cavity
  - Vacuum chamber and integration into MEBT
    - Prototype using 3D printer in TD
  - Timing and controls

Burst mode seed pulses to Fiber Amplifier followed by Free Space Amp

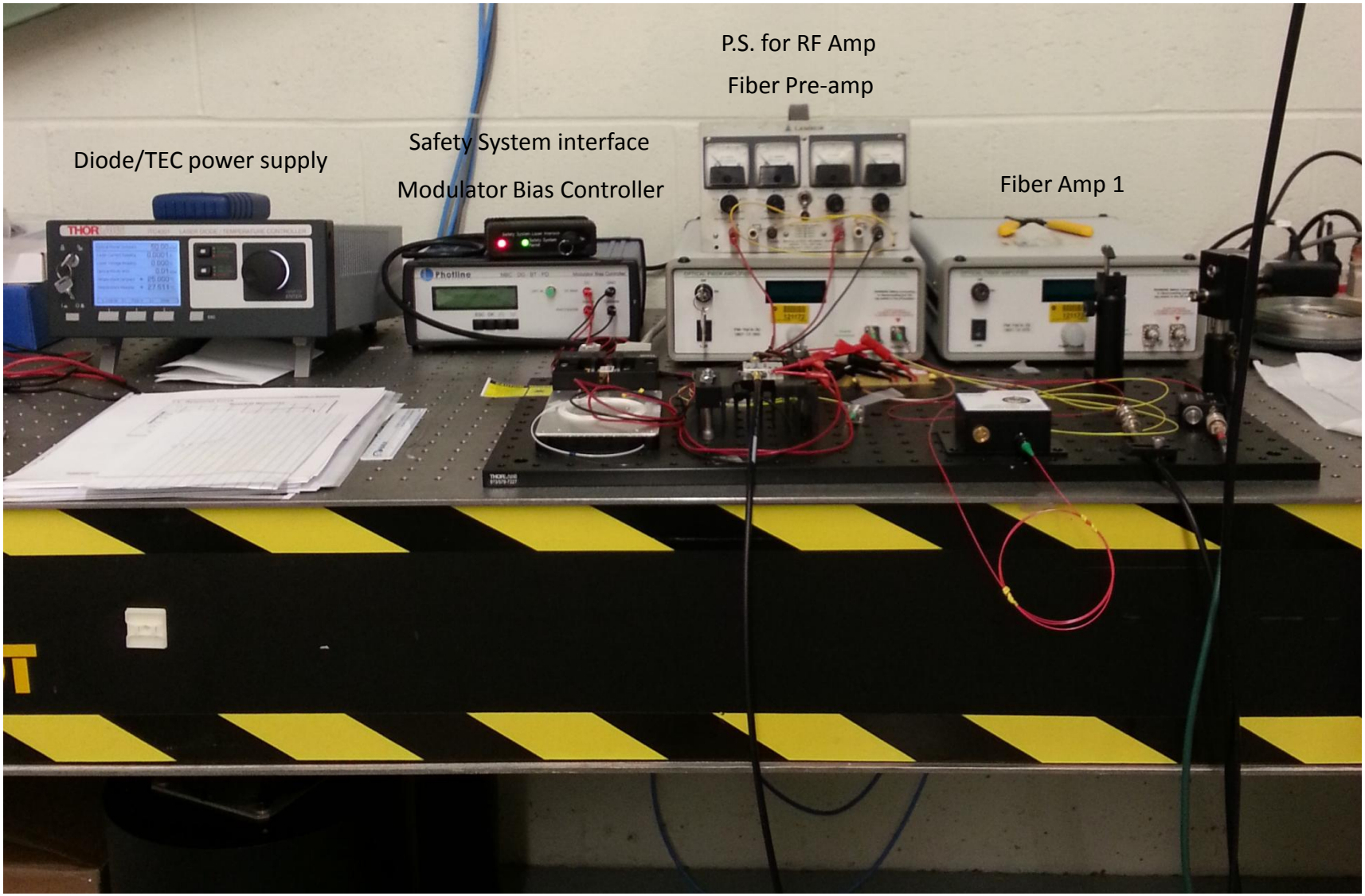


TRANSPORT BEAM SHAPING OPTICS & OPTICAL CAVITY

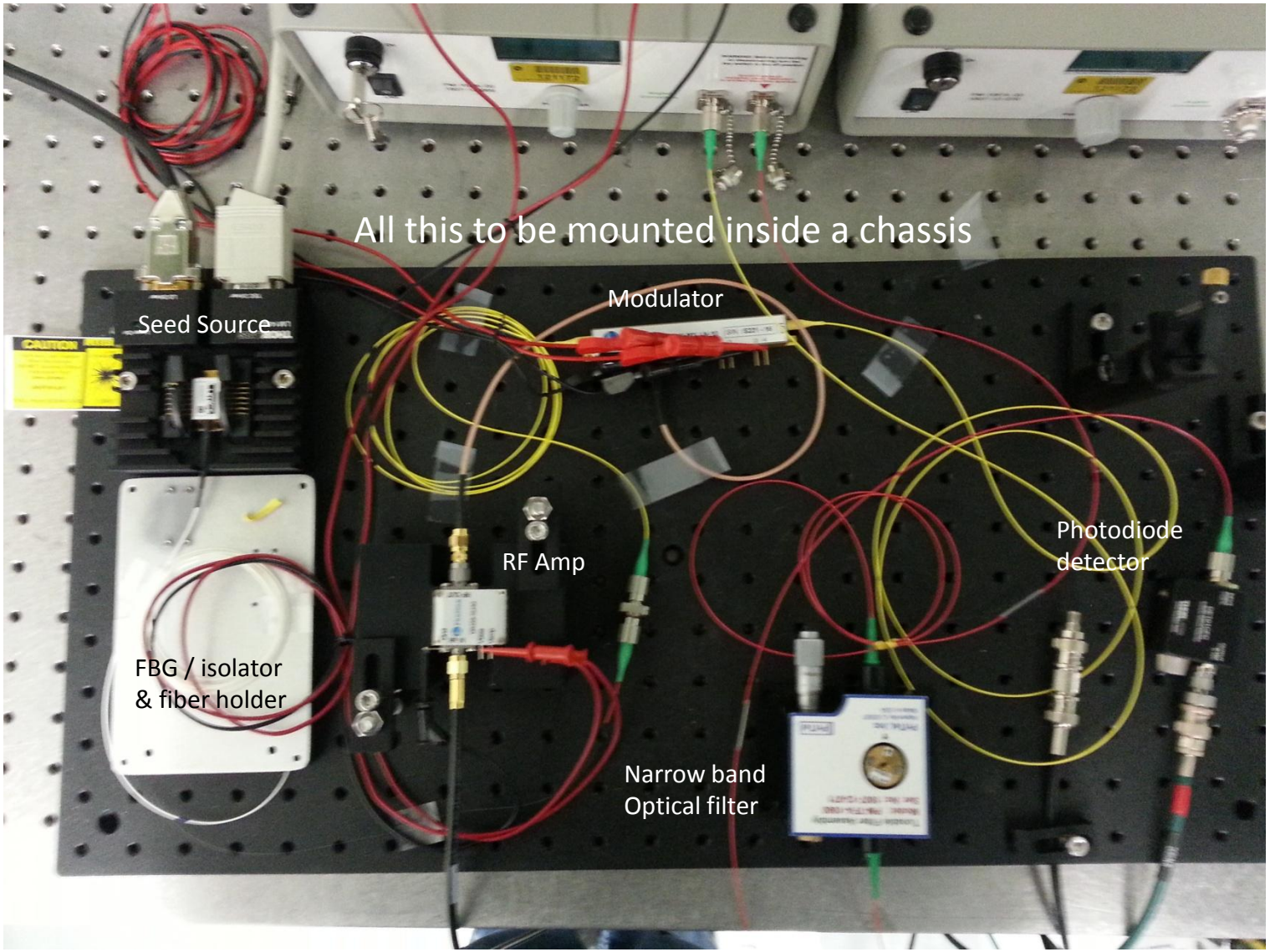
Status of the OPG and Fiber Amp

- We set up the optical pulse generation/fiber amplifier system in the new A0 instrumentation laser laboratory.
- We now have the seed laser and fiber amplifiers connected to the safety interlock system and have procedures in place and permission to operate the equipment on hand.
- We have started characterizing the characteristics of the system using a borrowed pulse generator and scope/spectrum analyzer in the A0 lab.

OPG Fiber Amp Components



Optical components

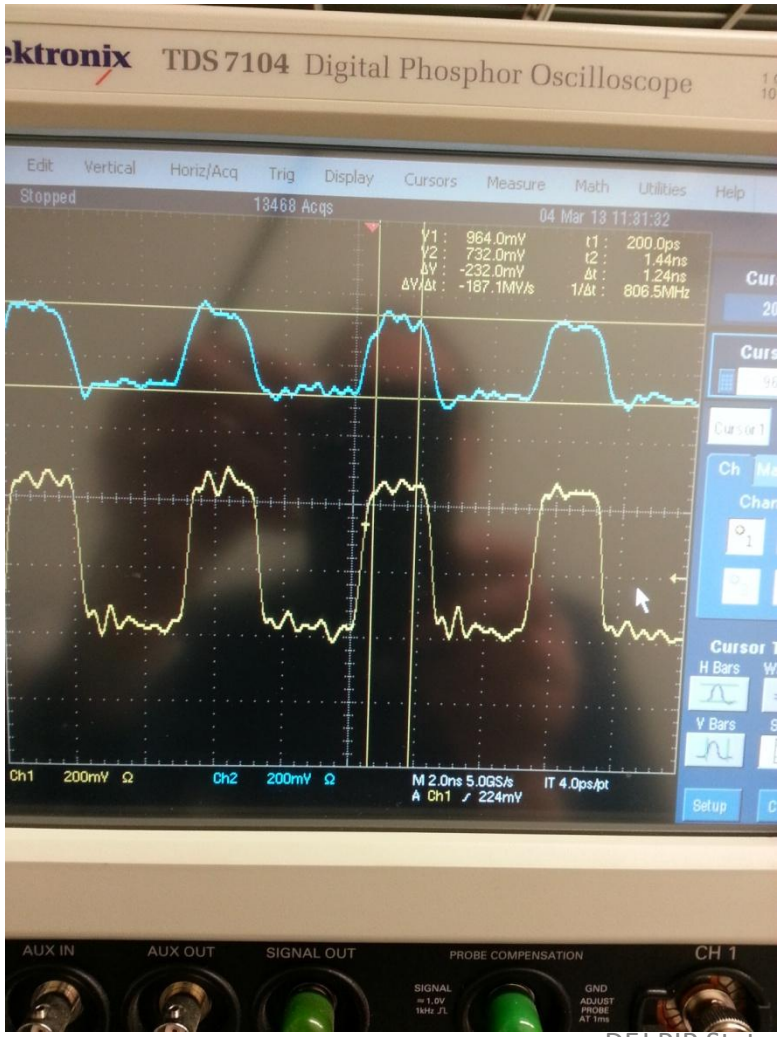


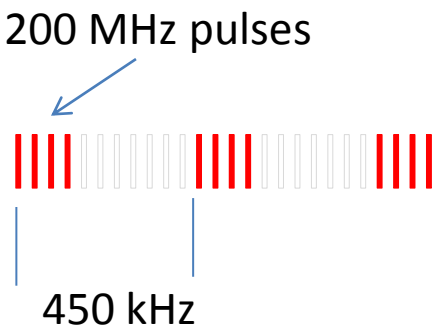
Current support equipment

- Borrowed from Peter Preito
  - HP 8131A 500 MHz pulse generator
  - RF splitter
- Instrumentation (Carl Lundberg)
  - Power supply for RF amplifier
- Equipment in A0 Instrumentation laser lab (Vic Scarpine/Andrea Saewert)
  - Tektronix TDS7104 1 GHz/10 GS/s oscilloscope
  - Agilent 86142B Optical Spectrum Analyzer
  - Thorlab's fiber coupled photodiode DET01CFC
  - Miscellaneous lab supplies…

200 MHz Laser Pulses

* I didn't have a blank floppy disk with me



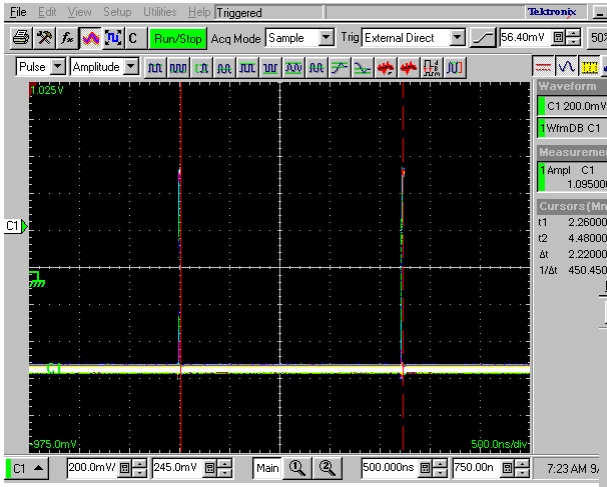


200 MHz Laser pulses (1.25 ns flattop) out of fiber pre-amp with (band pass filter included)

200 MHz pulsed from:
HP pulse generator input into modulator RF amplifier

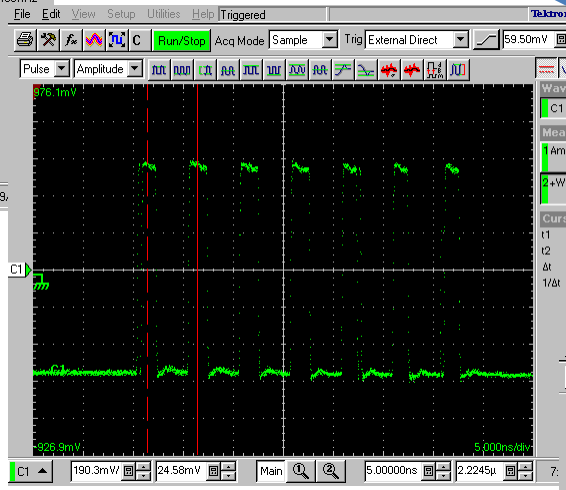
I need to add another pulser to trigger the HP at 450 kHz to create the burst structure

Picosecond Pulse Labs Model PSPL 12020 Screen Shots

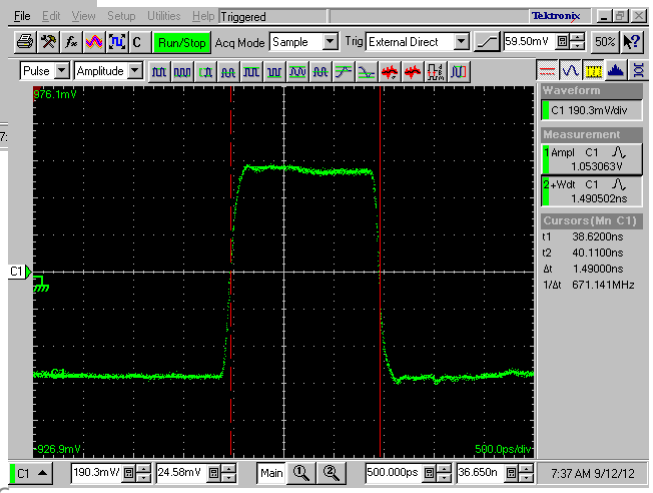


Burst rep rate of 450kHz

Decreasing time/division



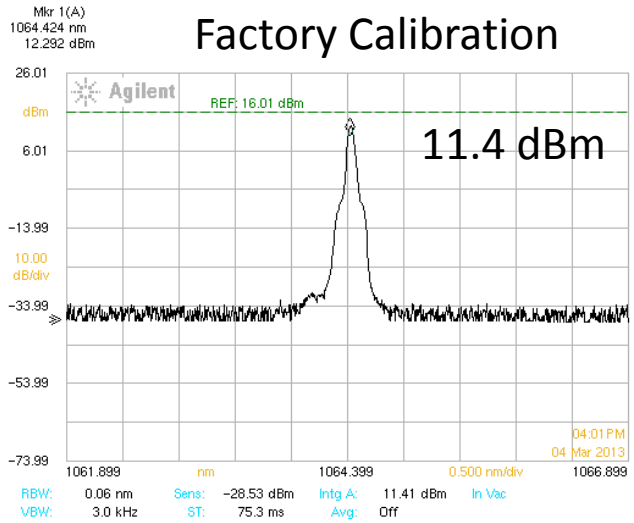
Seven 200MHz pulses



1.5ns FWHM pulse width

Seed Source

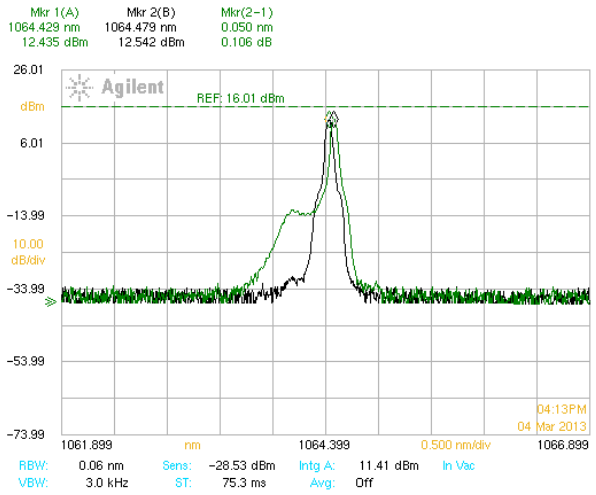
Factory Calibration



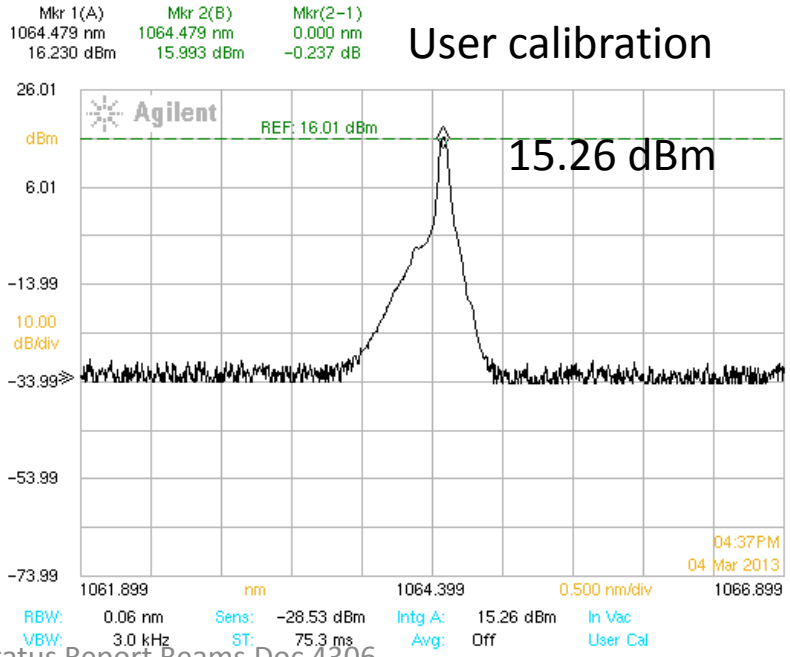
Seed source 50 mW with 1.6 dB isolator -> 34.75 mW
Measured 34.8 mW with Thorlabs PM20CH (15.4 dBm)

Measured power in seed source with OSA
Found: 11.4 dBm (13.8 mW) ---way too low ???

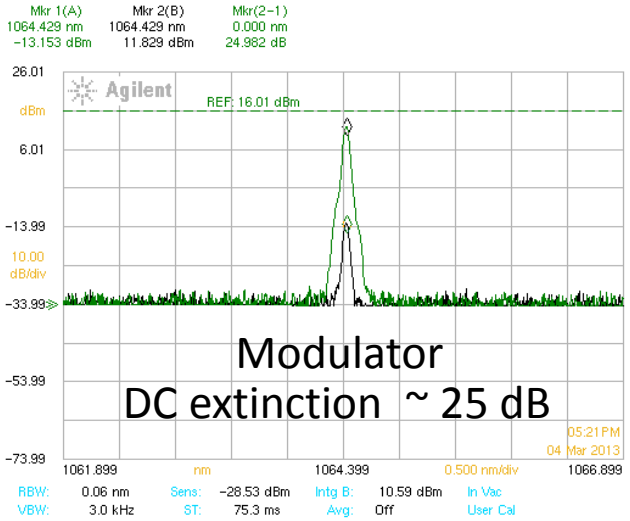
Installed user calibration based upon power meter.
This gives a closer result 15.26 dBm (33.5 mW) - <4%

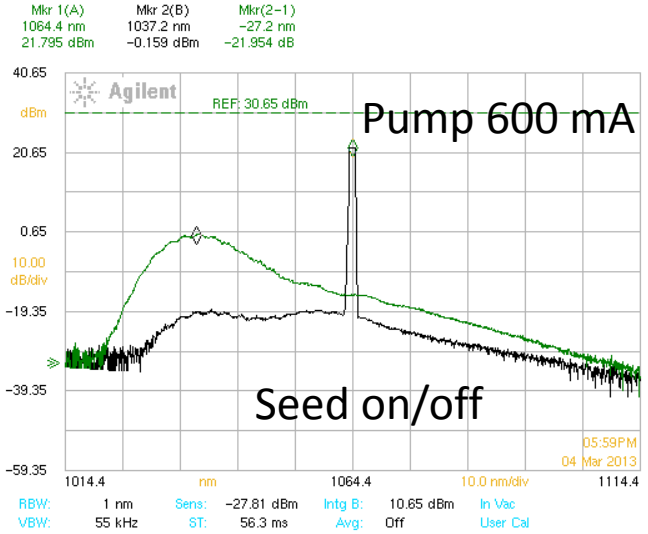


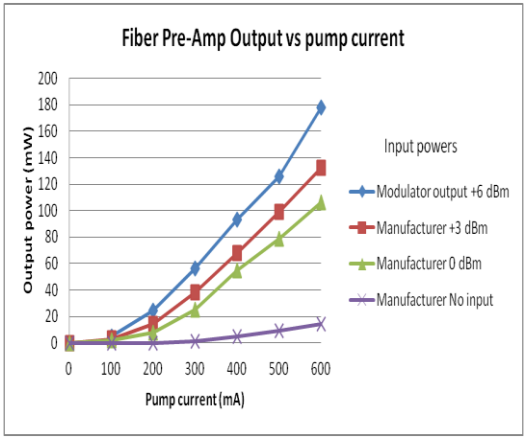
Line broadening of seed?



Modulator and Preamp

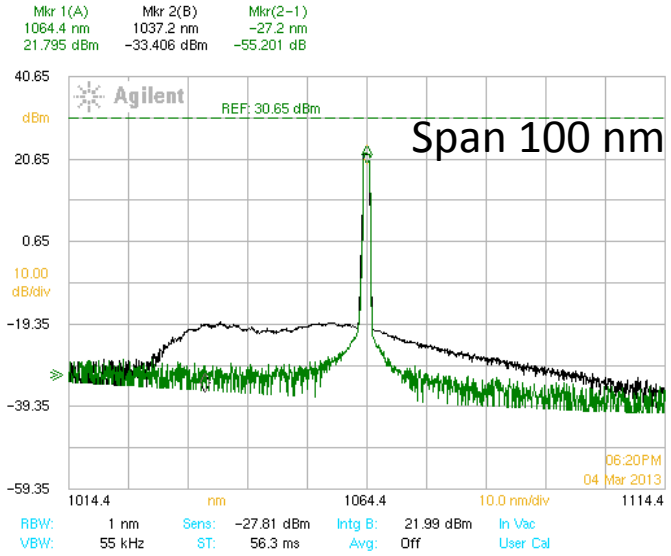


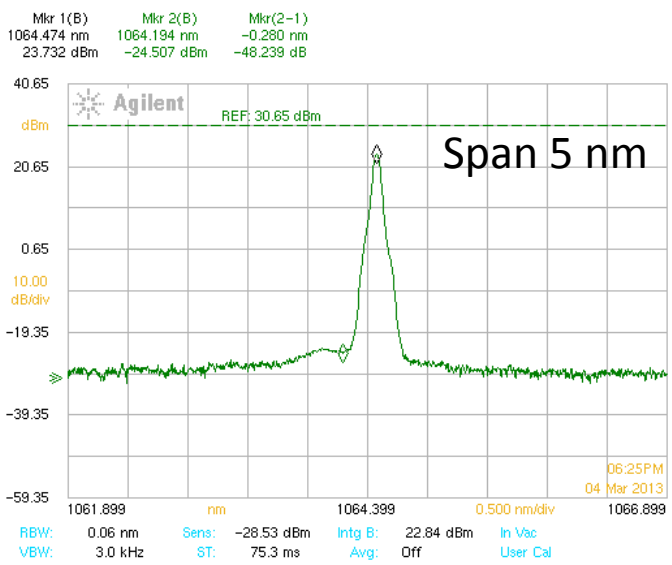




Note: operating seed at half power

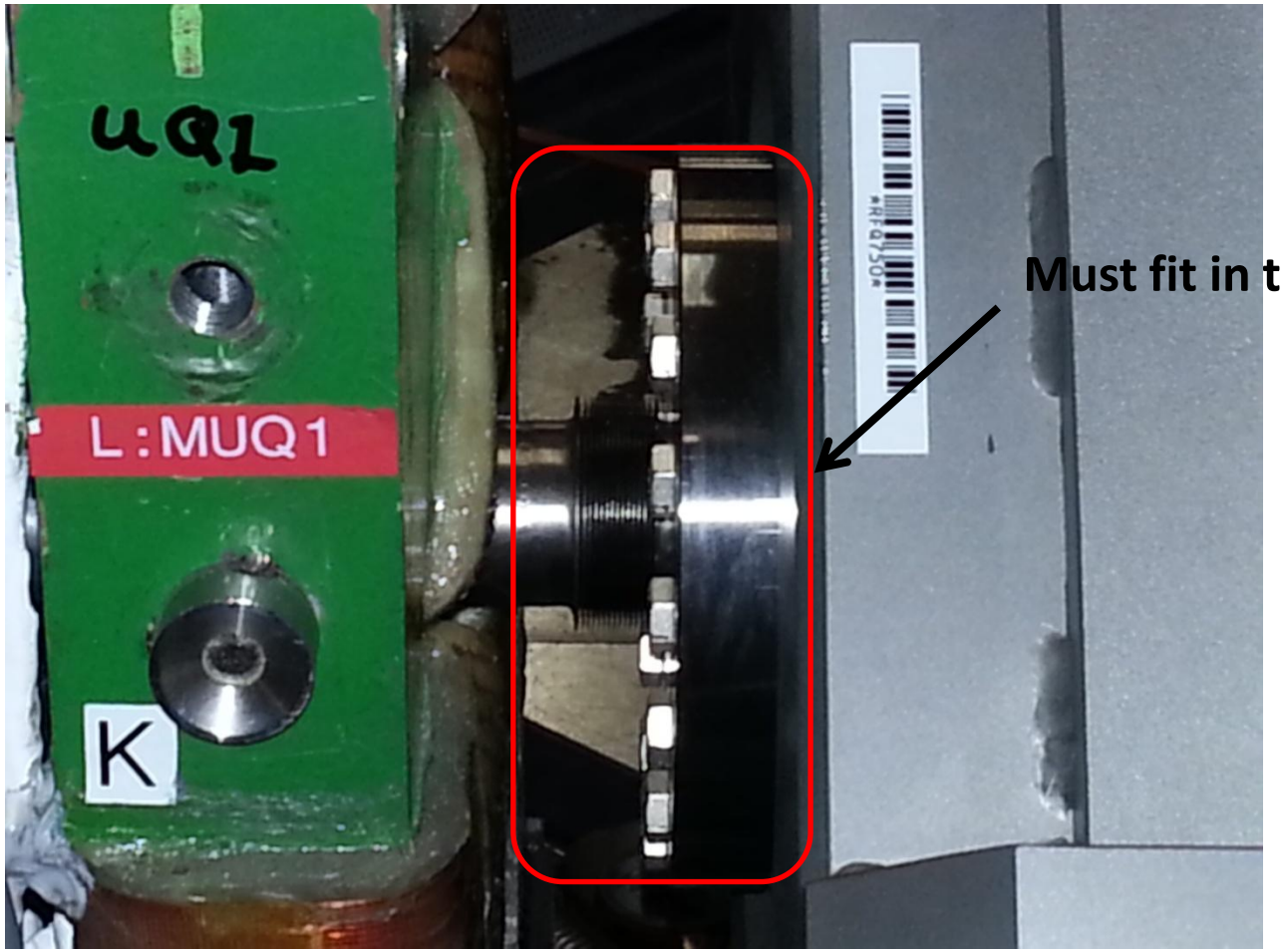
22.8 dBm
~190 mW
(~ nJ pulse energy)





Spectrum from pre-amp thru the Band Pass filter

Vacuum chamber



- The vacuum flange and beam pipe containing view ports and zig-zag cavity will prototyped using the 3D printer in TD.
  - Make new RFQ flange (thicker) with view port and internal optical cavity supports.

Summary

- We have assembled and starting to characterize the first components for the Laser Notcher.
- Will continue to learn how to operate the OPG and fiber amplifiers.
- We would like to put the OPG equipment inside a chassis to protect fibers and get rid of external power supply for RF amplifier.
- We will add another pulse generator to create 450 kHz burst.
- The temporal pulse structure out of the borrowed pulse generator is not as uniform as needed, but will work till we get the final pulser.
- We have not spent much time on the beam shaping optics since we demonstrated beam shaping and zig-zag cavity last fall. We need to add in an anamorphic prism pair to better shape the horizontal beam out of the piShaper to move forward with the design.
- Todd has been working on the free space amplifiers at NML which are very similar to those we will be using next year for the final amplification stage.
- John Sobolewski (MS co-op) is beginning to look at the vacuum holder for the optical cavity. We are planning to prototype this using the 3D printer.
- This summer add in the Pockels cell to create 15 Hz burst of pulses.
- By end of FY13 we should be ready to add new pulse generator, final fiber amplifier, and free space amplifier.